Renal Tissue Engineering with Decellularized Rhesus Monkey Kidneys: Age-Related Differences.

Public Summary:

New therapies for severely damaged kidneys are needed due to limited regenerative capacity and organ donor shortages. The goal of this study was to repopulate decellularized kidney sections in vitro and to determine the impact of donor age on recellularization. This was addressed by generating decellularized kidney scaffolds from different age groups using a procedure that removes cellular components while preserving the structural and functional properties of the native extracellular matrix (ECM). Kidney scaffolds were recellularized using explants and renal cell fractions. Results showed vimentin+ cytokeratin+ calbindin+ cell infiltration and organization around the scaffold ECM. The extent of cellular repopulation was greatest with scaffolds from the younger donors, and with seeding of mixed renal aggregates which formed tubular structures within the kidney scaffolds. These findings suggest that decellularized kidney sections from different age groups can be effectively repopulated with donor cells and the age of the donor is a critical factor in repopulation efficiency.

Scientific Abstract:

New therapies for severely damaged kidneys are needed due to limited regenerative capacity and organ donor shortages. The goal of this study was to repopulate decellularized kidney sections in vitro and to determine the impact of donor age on recellularization. This was addressed by generating decellularized kidney scaffolds from fetal, juvenile, and adult rhesus monkey kidney sections using a procedure that removes cellular components while preserving the structural and functional properties of the native extracellular matrix (ECM). Kidney scaffolds were recellularized using explants from different age groups (fetal, juvenile, adult) and fetal renal cell fractions. Results showed vimentin+ cytokeratin+ calbindin+ cell infiltration and organization around the scaffold ECM. The extent of cellular repopulation was greatest with scaffolds from the youngest donors, and with seeding of mixed fetal renal aggregates which formed tubular structures within the kidney scaffolds. These findings suggest that decellularized kidney sections from different age groups can be effectively repopulated with donor cells and the age of the donor is a critical factor in repopulation efficiency.